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Discovery of *Megachile* (*Pseudomegachile*) *lanata* (Fabricius, 1775) (Hymenoptera, Megachilidae) in Colombia, an adventive bee species from the Old World

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Abstract
We record for the first time for Colombia *Megachile* (*Pseudomegachile*) *lanata* (Fabricius, 1775), a bee species from Southeast Asia. This is the first record of an adventive bee species for the country besides *Apis mellifera* Linnaeus, 1758, the European honey bee. *Megachile lanata* appears to have arrived to the Caribbean coast of Colombia nearly half a century ago, reaching the Orinoquia region recently. We provide comments on diagnostic features to facilitate the recognition of this bee species and discuss its possible establishment in Colombia.

Key words
Conservation, dauber bees, invasive species, Megachilini, pollinators.

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Introduction

A few bee species, such as the European honey bee (*Apis mellifera* Linnaeus, 1758), have been introduced deliberately to many areas of the world for their products and services. However, the introduction of the majority of non-native bee species have been accidental and due to human activity (e.g., Cane 2003, Goulson 2003, Russo 2016). A recent review on this topic (Russo 2016) indicated that about 80 bee species (30 genera of 7 families) worldwide are non-native, which represents a small percentage (0.004%) of the global bee fauna. The invasive range of non-native bees varies in extension from an island (e.g., *Anthidium vigintiduopunctatum* Friese, 1904 in the Galápagos Archipelago) to nearly cosmopolitan in distribution, as in the case of the European honey bees and the wool carder bee *Anthidium manicatum* (Linnaeus, 1758) (e.g., Gonzalez et al. 2010, Strange et al. 2011). The majority of non-native bees belong to the families Megachilidae and Apidae, primarily in the genus *Megachile* Latreille, 1802. Most non-native bees are polylectic and nest in stems, twigs, and existing cavities, which facilitate their dispersion and adaptation to new environments when compared to olygolectic and ground-nesting bees (Cane 2003, Russo 2016).

Non-native species are often one of the biggest threats to the local biodiversity, although they can have positive impacts on the new environment. In the case of

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bees, non-native species might compete with the native fauna for floral resources or nesting sites, transmit pathogens or parasites, affect the pollination of native plants, disrupt pollination networks, or pollinate invasive plant species (Goulson 2003, Barthell et al. 2001, Hall and Avila 2016, Mallinger et al. 2017). They might also pollinate non-native crops and become economically important, as in the case of *Megachile rotundata* (Fabricius, 1787), a solitary bee introduced to many parts of the world as a pollinator of alfalfa (Pitts-Singer and Cane 2011).

Given the potential impacts of non-native species on the local biodiversity, the discovery of a new bee for the Colombian fauna is therefore of considerable interest. Herein, we report for the first time *Megachile* (*Pseudomegachile*) *lanata* (Fabricius, 1775), a species native to India (Pasteels 1965) and adventive to many regions of both hemispheres. In the Eastern Hemisphere, it occurs in Mauritius, Madagascar, the Hawaiian Islands, French Polynesia, and Thailand. In the Western Hemisphere, Mitchell (1962) suggested that *M. lanata* arrived through the West Indies during the slave-trade period in the 1700–1800s. Today, this species occurs in southern Florida, USA, Cuba, Jamaica, Puerto Rico, Saint Vincent and Grenadines, French West Indies, Trinidad and Tobago, Bolivia, Guyana, and French Guyana (Moure 1953, Genaro 1996, Pauly et al. 2001, Moure et al. 2007, Raw 2007, Meurgey 2016, Ascher and Pickering 2018). Thus, our records from Colombia extend the invasive range of this species in South America. We discuss the likely establishment of this species in Colombia and, to facilitate its recognition, provide comparative comments on diagnostic features.

Methods

The specimens discussed herein are deposited in the Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, Colombia (ICN) and Laboratorio de Investigaciones en Abejas, Universidad Nacional de Colombia, Bogotá, Colombia (LABUN). Although we did not find additional specimens of *M. lanata*, we also searched the insect collections at the Museo Entomológico, Facultad de Agronomía, Universidad Nacional de Colombia, Bogotá, and Museo Javeriano de Historia Natural Lorezo Uribe, S.J., Universidad Javeriana, Bogotá. We took photomicrographs with a Leica MC 170HD camera attached to a Leica M205A stereomicroscope. To map the distribution of the species, we used Google Earth (Google, Mountain View, CA, USA) to acquire the coordinates from the localities recorded in the specimen labels. We generated a map using SimpleMappr (Shorthouse 2010). We reproduced label data as appearing on the labels attached to the same specimen. We separated information on different labels by a single slash (/) and indicated annotations to clarify information in square brackets.

Results

Genus *Megachile* Latreille, 1802
Subgenus *Pseudomegachile* Friese, 1898

***Megachile* (*Pseudomegachile*) *lanata* (Fabricius, 1775)**
Figure 1

Diagnosis. Specimens of *M. lanata* can be reliably identified to *M.* (*Pseudomegachile*) using Michener's (2007) keys to the subgenera of *Megachile*. Both sexes of *M. lanata* differ from *M.* (*Pseudomegachile*) *ericetorum* Lepeletier, 1841, the only other species of *M.* (*Pseudomegachile*) adventive to the New World (Sheffield et al. 2010), as well as from any other megachilid bee from Colombia, by the body pubescence. In *M. lanata*, the pubescence of the head, mesosoma, and first 2 terga is orange, and thus it contrasts with the remaining black terga. In addition, the third to fifth terga have white apical bands of setae and the female metasomal scopa is white (Fig. 1B). Although *M. lanata* and *M. ericetorum* are about the same size (12–16 mm in body length), the only record of the latter species is from Canada and its body pubescence is whitish to yellowish, including the female metasomal scopa. In addition, the male preapical carina of the sixth tergum is denticulate in *M. ericetorum* whereas in *M. lanata* is nearly entire, sometimes ondulate and medially emarginate. Because of the lack of interdental laminae (cutting edges sensu Michener 2007) between the mandibular teeth of the female mandible, *M. lanata* can be confused with species of *M.* (*Chrysosarus*) Mitchell. However, no species of this subgenus possess a body coloration similar to that of *M. lanata*.

New records (*n* = 2♀, 1♂). Colombia. **La Guajira:** 1♀, Riohacha, V-16-1990 [May 16, 1990], *G. Nates* / 5814 / LABUN005949 (LABUN); **Magdalena:** 1♀, Maguey, IV 1971 [April 1971] / ICN095230 (ICN); **Meta:** 1♂, Puerto Lopez, Remolinos, 4 de sep 2015 [September 4, 2015], col *Electiva II 2015* / 30512 (LABUN).

Biology. This species is solitary, polylectic, and nest in pre-existing cavities, old nests of sphecid wasps, and trap-nests. Brood cells are made of mud. In the West Indies and Cuba, both sexes are active throughout the year (Genaro 1996, Raw 2007, Meurgey 2016).

Discussion

This is the first record of an adventive bee species for Colombia besides the European honey bee. We do not know how and when exactly *M. lanata* arrived into the country. However, our records indicate that *M. lanata* has been undetected in Colombia for nearly half a century, which is not surprising given that the melittofauna of the country is still in its early stages of exploration. In addition, most taxonomic work in Colombia has been focused on corbiculate bees (Gonzalez 2014). Given the wide distribution of *M. lanata* on the Caribbean islands and earlier records from the Departments of Magdalena

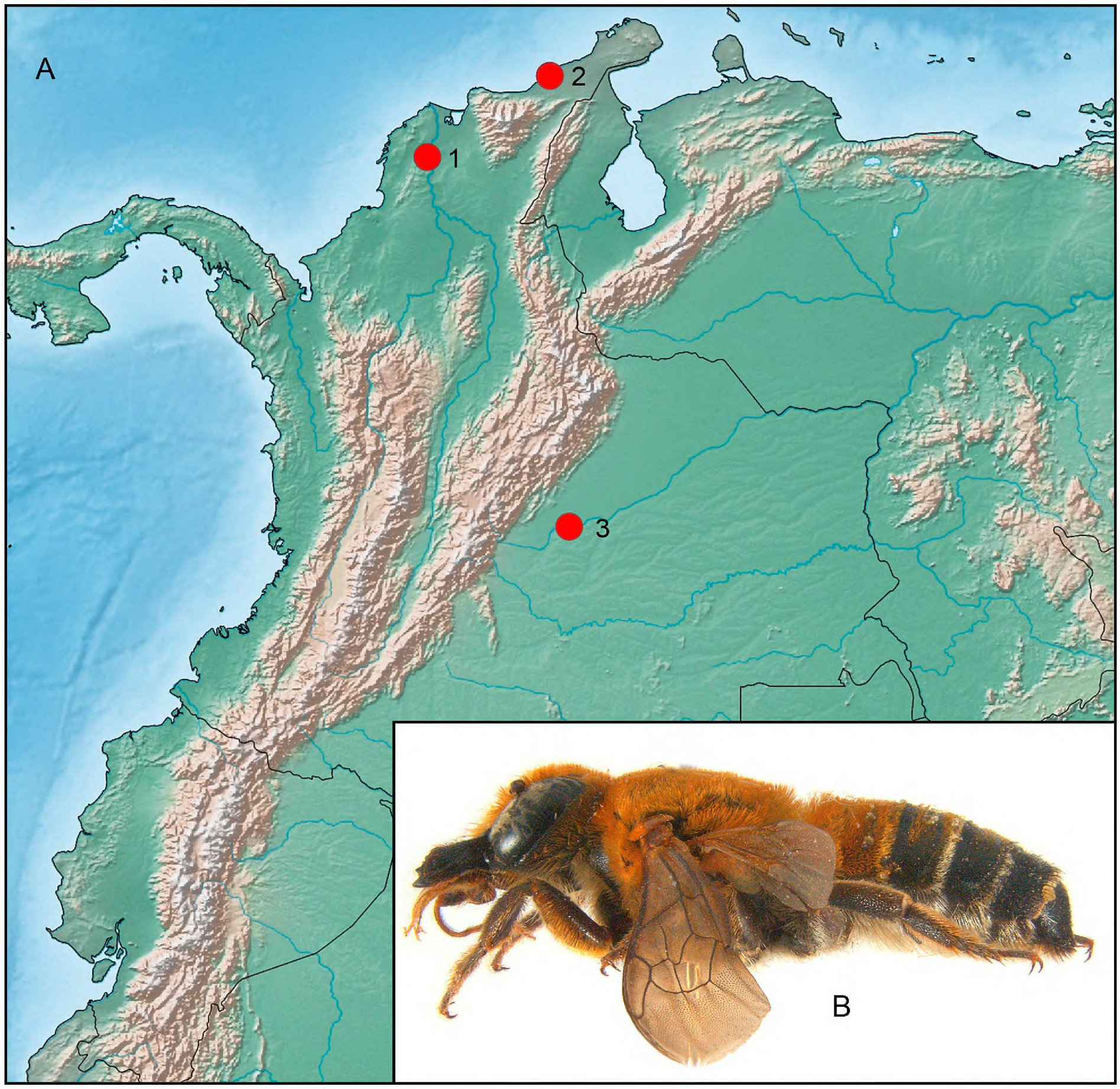

Figure 1. *Megachile* (*Pseudomegachile*) *lanata* (Fabricius) in Colombia. **A.** Collection localities indicated by red circles, 1 = Maguey, Magdalena; 2 = Riohacha, La Guajira; 3 = Puerto Lopez, Meta. **B.** Lateral habitus of a female.

and La Guajira, both on the Caribbean coast, it is likely that it arrived from any of these islands.

Adventive species may fail to become established if suitable habitats or adequate resources are not available. This appears not to be the case for *M. lanata* in Colombia, as the most recent record is from 2015. However, field collections by the senior author did not detect this species near Santa Marta (Magdalena) in December of 2011 nor in Riohacha and nearby areas in La Guajira during December of 2016. This suggests either that Colombian populations of *M. lanata* are sparse or that this species is highly seasonal, as specimens from the Caribbean coast were collected in April and May. However, the latter is unlikely because in the West Indies and Cuba both sexes are active throughout the year (Genaro 1996), and the latest record in Colombia is from September.

The records of *M. lanata* in Colombia are from 2 natural regions (Fig. 1A), each characterized by a different type of vegetation. Dry tropical forests are predominant in the Caribbean region whereas tropical grasslands and savannas dominate the Orinoquia region. We do not know if the presence of *M. lanata* on each natural region represents an independent event of colonization or if the most recent record from Puerto Lopez (Orinoquia region) is a range expansion from its likely initial introduction in the Caribbean coast. Although either scenario is equally plausible, it shows the potential of this species to colonize different ecosystems in Colombia.

Neither positive nor negative impacts have yet been recorded for *M. lanata* in its invasive range (Russo 2016), and thus the potential impact of this species on the Colombian biodiversity remains to be investigated. Future studies in Colombia should monitor the establishment and spread of this species, as well as record its floral hosts, as many non-native bees tend to share floral resources with native bees (Matteson et al. 2008). We

hope this work encourages further research measuring direct, long-term, and population-level effects of this bee to understand its potential impact on the Colombian melittofauna.

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Authors' Contributions

VHG, DAG, JJS, and RO conceived and performed study, analyzed the data, and wrote the paper. All authors have read and approved the submitted manuscript.

References

Ascher JS, Pickering J (2018) Discover Life bee species guide and world checklist (Hymenoptera: Apoidea: Anthophila). Draft 50. http://www.discoverlife.org/mp/20q?guide=Apoidea_species. Accessed on: 2018-3-31.

Barthell JF, Randall JM, Thorp RW, Wenner AM (2001) Promotion of seed set in yellow star-thistle by honey bees: evidence of an invasive mutualism. Ecological Applications 11 (6): 1870–1883. http://doi.org/dgf8pb

Cane JH (2003) Exotic nonsocial bees (Hymenoptera: Apiformes) in North America: ecological implications. In: Strickler K, Cane JH (Eds) For Non-Native Crops, Whence Pollinators of the Future? Thomas Say Publications in Entomology: Proceedings. Entomological Society of America, Lanham, Maryland, 113–126.

Genaro JA (1996) [1997] Key to the genus *Megachile*, *Chalicodoma* group (Hymenoptera: Megachilidae) in Cuba. Revista de Biología Tropical 44 (3) [45 (1)]: 193–198.

Gonzalez VH, Koch JB, Griswold T (2010) *Anthidium vigintiduopunctatum* Friese (Hymenoptera: Megachilidae): the elusive "dwarf bee" of the Galápagos Archipelago? Biological Invasions 12 (8): 2381–2383. https://doi.org/10.1007/s10530-009-9651-9

Gonzalez VH (2014) Ch. 7. Abejas del bosque seco tropical colombiano. In: Pizano C, García H (Eds) El Bosque Seco Tropical en Colombia. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Bogotá, DC, Colombia, 215–227.

Goulson D (2003) Effects of introduced bees on native ecosystems. Annual Review of Ecology, Evolution, and Systematics 34: 1–26. https://doi.org/10.1146/annurev.ecolsys.34.011802.132355

Hall HG, Avila L (2016) *Megachile sculpturalis*, the giant resin bee, overcomes the blossom structure of sunn hemp (*Crotalaria juncea*) that impedes pollination. Journal of Melittology 65: 1–11. https://doi.org/10.17161/jom.v0i65.5887

Mallinger RE, Gaines-Day HR, Gratton C (2017) Do manage bees have negative effects on wild bees?: a systematic review of the literature. PLoS ONE 12 (2): e0189268. https://doi.org/10.1371/journal.pone.0189268

Matteson KC, Ascher JS, Langellotto GA (2008) Bee richness and abundance in New York City urban gardens. Annals of the Entomological Society of America 101 (1): 140–150. http://doi.org/fkszjg

Meurgey F (2016) Bee species and their associated flowers in the French West Indies (Guadeloupe, Les Saintes, La Désirade, Marie Galante, St Barthelemy and Martinique) (Hymenoptera: Anthophila: Apoidea). Annales de la Société Entomologique de France 52 (4): 209–232. https://doi.org/10.1080/00379271.2016.1244490

Michener CD (2007) The Bees of the World [2nd Edition]. Johns Hopkins University Press, Baltimore, xvi + [i] + 953 pp.

Mitchell TD (1962) Bees of the Eastern United States, vol. II. North Carolina Agricultural Experiment Station, Raleigh, NC, USA.

Moure JS (1953) Notas sobre Megachilidae de Bolivia, Perú y Chile. Dusenia 4 (2): 113–124.

Moure JS, Melo GAR, DalMolin A (2007) Megachilini Latreille, 1802. In: Moure JS, Urban D, Melo GAR (Eds) Catalogue of Bees (Hymenoptera, Apoidea) in the Neotropical Region. Curitiba, Brazil: Sociedade Brasileira de Entomologia, 917–1001.

Pasteels JJ (1965) Revision des Megachilidae (Hymenoptera Apoidea) de L'Afrique noire. I. Les genres *Creightoniella* [sic], *Chalicodoma* et *Megachile* (s. str.). Musee Royal de l'Afrique Centrale. Tervuren, Belgique Annales. Serie IN-8, Sciences Zoologiques 137: 1–579.

Pauly A, Brooks RW, Nilsson A, Pesenko YA, Eardley CD, Terzo M, Griswold T, Schwarz M, Patiny S, Munzinger J, Barbier Y (2001) Hymenoptera Apoidea de Madagascar et des îles voisines. Musee Royal de l'Afrique Centrale, Annales Sciences Zoologiques 286: 1–390, pl. 16.

Pitts-Singer TL, Cane JH (2011) The alfalfa leafcutting bee, *Megachile rotundata*: the world's most intensively managed solitary bee. Annual Review of Entomology 56: 221–237. https://doi.org/10.1146/annurev-ento-120709-144836

Raw A (2007) An annotated catalogue of the leafcutter and mason bees (Genus *Megachile*) of the Neotropics. Zootaxa 1601: 1–127.

Russo L (2016) Positive and negative impacts of non-native bee species around the world. Insects 7 (4): 69. https://doi.org/10.3390/insects7040069

Sheffield CS, Griswold T, Richards MH (2010) Discovery of the western Palearctic bee, *Megachile* (*Pseudomegachile*) *ericetorum* (Hymenoptera: Megachilidae), in Ontario, Canada. Journal of the Entomological Society of Ontario 141: 85–92.

Shorthouse DP (2010) SimpleMappr, an online tool to produce publication-quality point maps. http://www.simplemappr.net. Accessed on: 2018-9-26.

Strange J, Koch J, Gonzalez VH, Nemelka L, Griswold T (2011) Global invasion by *Anthidium manicatum* (Linnaeus) (Hymenoptera: Megachilidae): assessing potential distribution in North America and beyond. Biological Invasions 13 (8): 2115–2133. https://doi.org/10.1007/s10530-011-0030-y